M. Sc. (Sem. IV) (CBCS) Examination
April / May - 2017
Inorganic Chemistry
(C(I)-403 : Bonding in Complexes)

Faculty Code : 003
Subject Code : 010403

Time : $2\frac{1}{2}$ Hours]   [Total Marks : **70**

Instructions: (1) All Questions are compulsory
                 (2) All Questions carry equal Marks

1   Answer the following (Any Seven)   [14]

    a.   Write a short note on charge transfer spectra

    b.   Explain hole formalism

    c.   Discuss the effect of spin orbit coupling on E terms

    d.   Determine $S, M_L, L. M_L.$ and J in d^2 configuration

    e.   Write note on laporte selection rules

    f.   How Tanabe – Sugano diagrams are useful in coordination chemistry

    g.   What are spectral terms?

    h.   Discuss Stepup and Stepdown operators?

    i.   Explain spiting of d orbital

    j.   Write note on S-S coupling

2 Answer the following (Any Two)   [14]

   a. Show that $< m/x^4+y^4+z^4/m' > = 11/21\ r^4$ when $m = m' \pm 1$

   b. Construct the correlation diagram d^2 configuration

   c. Explain the Tanabe-Sugano diagram for d^1 to d^9

3 Answer the following (Any Two)   [14]

   a. Show that $\langle m/x^4+y^4/m' \rangle = $ zero, where $m \neq m'$

   b. Discuss the Electronic spectra of trivalent Chromium (d^3) compound

   c. Calculate energy of the integral $< \phi_2\phi_0 \mid Voct \mid \phi_2\phi_0 >$,
       where $< \phi_0 \mid Voct \mid \phi_0 > = 6Dq$ and $< \phi_2 \mid Voct \mid \phi_2 > = Dq$

4 Answer the following   [14]

   a. Show that $P_l \cos \theta = 1/2(5\cos^3\theta - 3\cos\theta)$, where $l = 3$
   b. Derive all the possible Microstates for d^2-configuration

5 Derive the formula $Voct = 6Ze^2/a+(X^4+Y^4+Z^4-3/5r^4)$ in octahedral field

                              Or

5 Answer the following (Any Two)   [14]

   a. Explain Hund's rule to determine ground level spectral term and find out the spectral term for Co^{++} and Cr^{++}

   b. Using Stepup and Stepdown operators
       Derive $L < 3, 0 >$, from $L < 3, + 1 >$